Foreword

National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF COMMERCE

NOAA Fisheries Service
Northeast Cooperative Research Partners Program

The National Marine Fisheries Service (NOAA Fisheries Service), Northeast Cooperative Research Partners Program (NCRPP) was initiated in 1999. The goals of this program are to enhance the data upon which fishery management decisions are made as well as to improve communication and collaboration among commercial fishery participants, scientists and fishery managers. NOAA Fisheries Service works in close collaboration with the New England Fishery Management Council's Research Steering Committee to set research priorities to meet management information needs.

Fishery management is, by nature, a multiple year endeavor which requires a time series of fishery dependent and independent information. Additionally, there are needs for immediate short-term biological, oceanographic, social, economic and habitat information to help resolve fishery management issues. Thus, the program established two avenues to pursue cooperative research through longer and short-term projects. First, short-term research projects are funded annually through competitive contracts. Second, three longer-term collaborative research projects were developed. These projects include: 1) a pilot study fleet (fishery dependent data); 2) a pilot industry based survey (fishery independent data); and 3) groundfish tagging (stock structure, movements and mixing, and biological data).

> First, a number of short-term research projects have been developed to work primarily on commercial fishing gear modifications, improve selectivity of catch on directed species, reduce bycatch, and study habitat reactions to mobile and fixed fishing gear.
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> Second, two cooperative research fleets have been established to collect detailed fishery dependent and independent information from commercial fishing vessels. The original concept, developed by the Canadians, referred to these as "sentinel fleets". In the New England groundfish setting it is more appropriate to consider two industry research fleets. A pilot industry-based survey fleet (fishery independent) and a pilot commercial study fleet (fishery dependent) have been developed.
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> Additionally, extensive tagging programs are being conducted on a number of groundfish species to collect information on migrations and movements of fish, identify localized or subregional stocks, and collect biological and demographic information on these species.

For further information on the Cooperative Research Partners Programs please contact:

National Marine Fisheries Service (NOAA Fisheries Service)
Northeast Cooperative Research Partners Program

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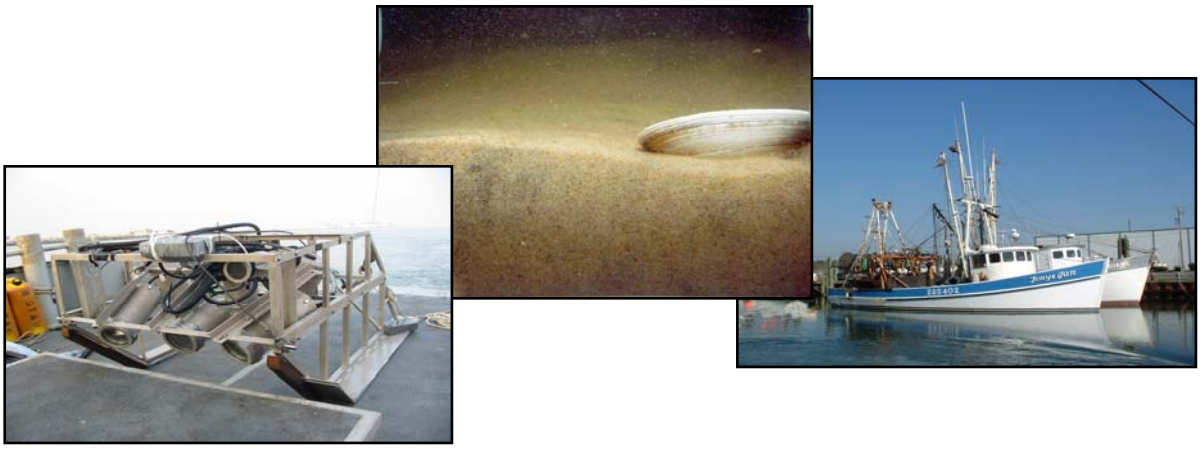
(401) 782-3323 – Northeast Fisheries Science Center, Cooperative Research Office, Narragansett Laboratory

www.nero.noaa.gov/StateFedOff/coopresearch/

Draft Final Report

DEVELOPMENT OF SPECIES-SPECIFIC ESSENTIAL HABITAT INDICES USING BIOLOGICAL AND HABITAT DATA COLLECTED USING REMOTE SENSING

Contract No. EA133F-03-CN-0048



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Versar INC.

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Contract Number: EA133F-03-CN-0048

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EXECUTIVE SUMMARY

The habitat requirements of many commercially important fish species must be better understood to adequately manage their populations. One means of identifying habitat variables that may be needed by a particular species is to compare the characteristics of the habitat between areas where the species occurs in high abundance versus low abundance. Because fishermen have obtained this type of knowledge through experience and repeated sampling, they are able to delineate productive versus unproductive habitats within large-scale fishing grounds. The objective of this study was to work in partnership with local commercial fishermen to identify and sample different areas of the near-shore day fishery where summer flounder *Paralichthys dentatus* are typically captured in different abundances, and then use underwater imagery to characterize the benthic habitat and develop an index of essential habitat for summer flounder.

Local commercial fishermen in two fisheries, one in Maryland and the other in Rhode Island, demarcated areas that were productive and unproductive for summer flounder, and then sampled using commercial trawls during summer 2004. Fishermen were effective at determining the relative productivity of different trawling sites within a study area, and captured significantly more fish at sites that they had considered to be productive *a priori*. Their selection of productive and unproductive sites was based on their experiential knowledge gained from years of fishing their local waters. Thus, the different catch rates at productive and unproductive sites within the fishing grounds were due to differences in local habitat characteristics rather than random variation.

One habitat factor considered by fishermen in selecting trawling locations was water depth. Most flounder were captured in depths of 10-20 m, which generally occurred in troughs between shoals in Maryland but along a continuous slope in Rhode Island. However, both high and low catches occurred within this range of depths, and fishermen correctly identified productive versus unproductive habitat within the preferred depth range. These data suggest that one or more habitat characteristics in addition to depth influenced flounder distribution. Our cooperating fishermen were not able to identify microhabitat characteristics that might affect productivity within the fishing grounds.

In this study, we characterized the physical and biological features of the substrate along trawl transects using underwater video and a sediment profiling camera to determine if quantifiable microhabitat characteristics would provide a means of discriminating between the productive and unproductive flounder habitat. A series of generalized linear models were fit to relate habitat variables measured to flounder catch per unit of trawling effort, but no model predicted relative abundance of flounder or site productivity. These negative results appear to be due to the homogeneity in micro-habitat features measured across all sites, whether productive or unproductive. The substrate in both study areas was dominated by sand, but included small amounts of larger particles, shell hash, tubes, and other biogenic structures. The resulting poor association between adult summer flounder abundance and micro-habitat features of the substrate during summer precluded the development of an index of essential fish habitat based on

substrate features. We conclude that the abundance of adult summer flounder within the fishing grounds was affected more by meso-scale habitat variables, unmeasured in our study, than by micro-habitat features that could be quantified using the remote sensing technologies employed. However, flounder may have been able to find small areas of preferred micro-habitat features somewhere along trawl transects, even for trawls where different features predominated. Only seven summer flounder were sighted on underwater video, but all were located in fine-sand substrate. Thus, the mismatch in scale of measurement between the trawl and video surveys could also have contributed to the negative results.

We applied the same analytical methods to examine the relation between habitat variables and abundance of a second related species captured during the survey, windowpane flounder *Scophthalmus aquosus*. The spatial pattern of windowpane flounder abundance was similar to that of summer flounder, and was not appreciably related to micro-habitat variables measured. A multivariate analysis examining the relationship of our target species to the community of fish taken in the sample trawls indicated that summer flounder was associated with a community that included clearnose skate, bullnose ray, southern stingray, spotted hake, striped searobin, and scup, in addition to windowpane in Maryland. In Rhode Island the species closely associated with summer flounder were butterfish, scup, winter skate, blue runner, spiny dogfish, bluefish, and windowpane flounder.

It is possible that a large proportion of sandy habitat is a component of the essential fish habitat for summer flounder, but this study suggests that additional habitat features not measured here are important to identify suitable habitat. Our findings indicate that micro-habitat characteristics, such as those that could be quantified using remote sensing, were similar across productive and unproductive sites in both study areas, and thus do not serve as indicators of habitat suitability for the two species we addressed in our analysis, summer and windowpane flounders. As a result, our concept of employing quantitative metrics derived from those characteristics to develop an index of EFH could not be implemented as originally planned. We confirmed that our cooperating commercial fishermen could reliably predict abundance of the target species in various trawling locations, but that the microhabitat features of those locations did not provide a basis for discriminating between the productive and unproductive sites within the general region. The habitat preference of both summer flounder and windowpane appeared to be influenced by one major macro-habitat feature, depth, but to also be influenced by other unmeasured (most likely meso-scale) habitat features that were associated with fixed locations. For example, our cooperating commercial fishermen in Maryland correctly identified productive versus unproductive habitat based on shoal and trough bathymetry. Additional research that measures meso-scale variables such as local current and distribution of prey items may best characterize essential habitat for summer flounder and associated species.